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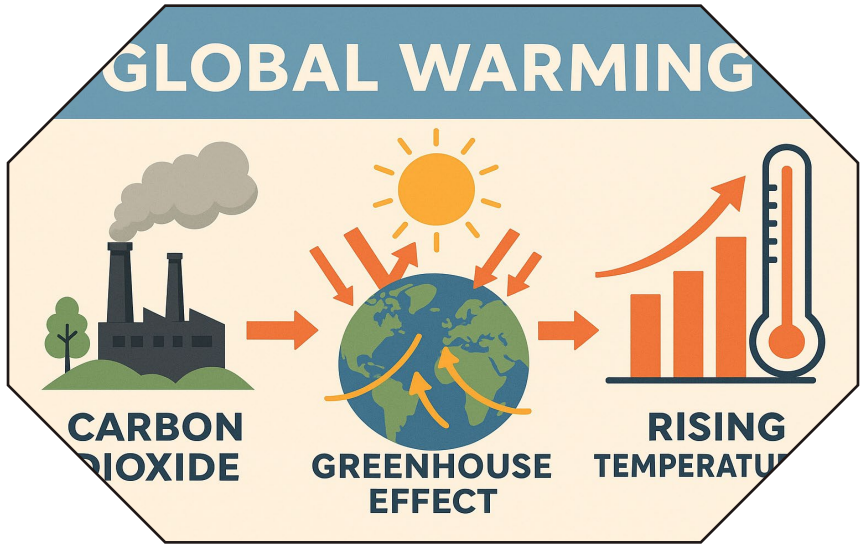
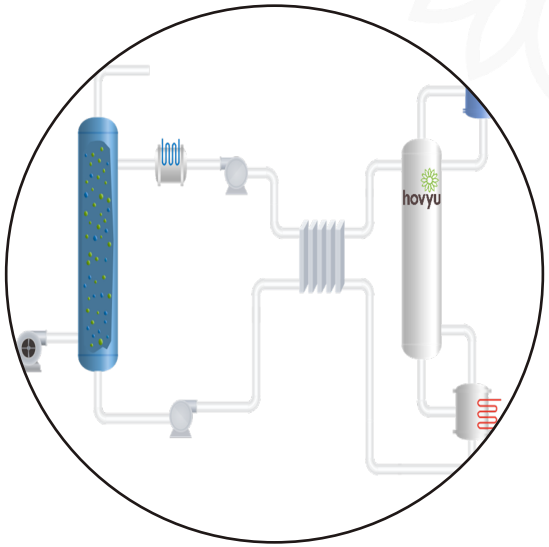
CO_2 capture solutions

for reaching carbon neutrality

21/10/2025

The carbon emission issue





Energy intense
Hard-to-abate
Industrial sectors

Environmental problems

Technical solutions (e.g. Carbon capture)

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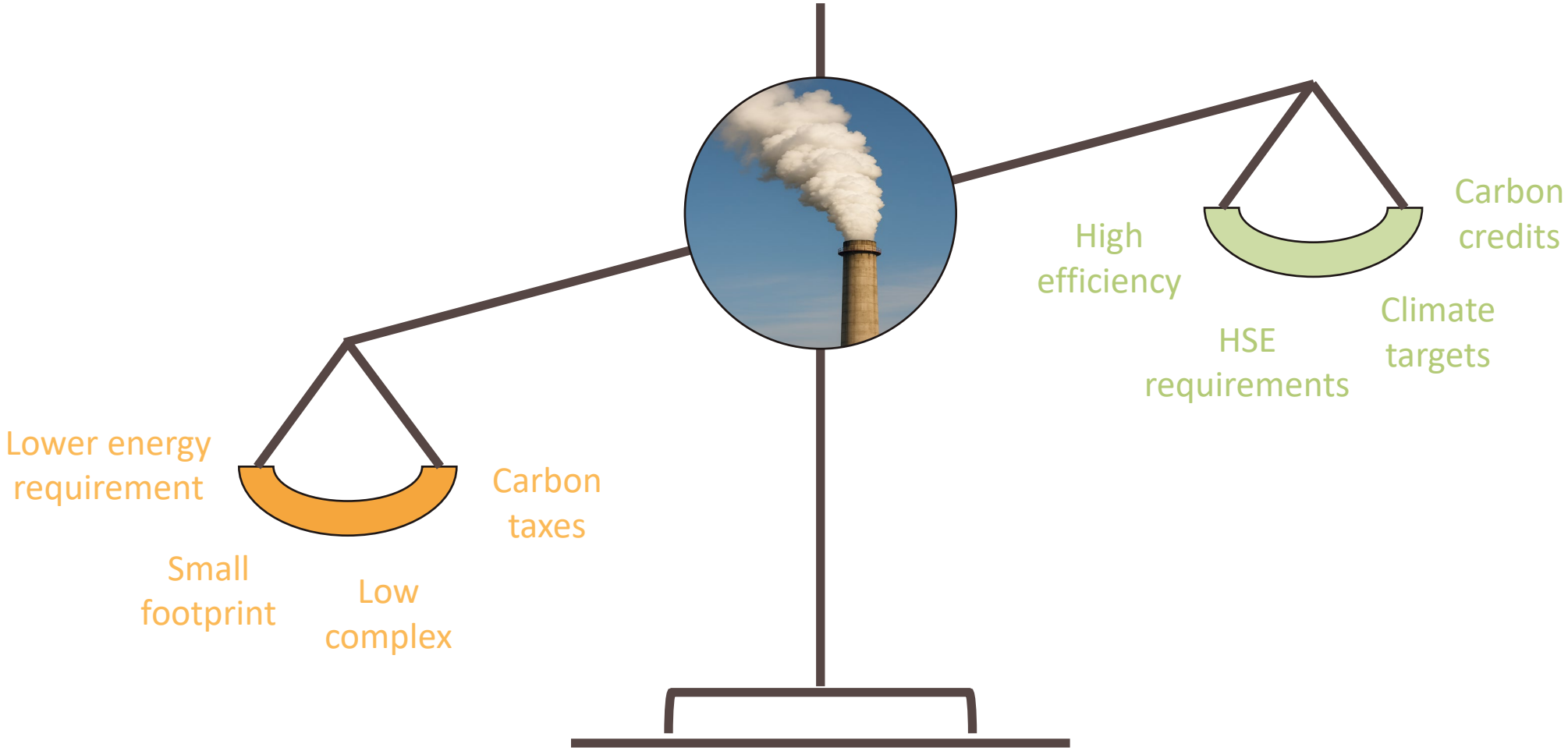
Carbon capture scale



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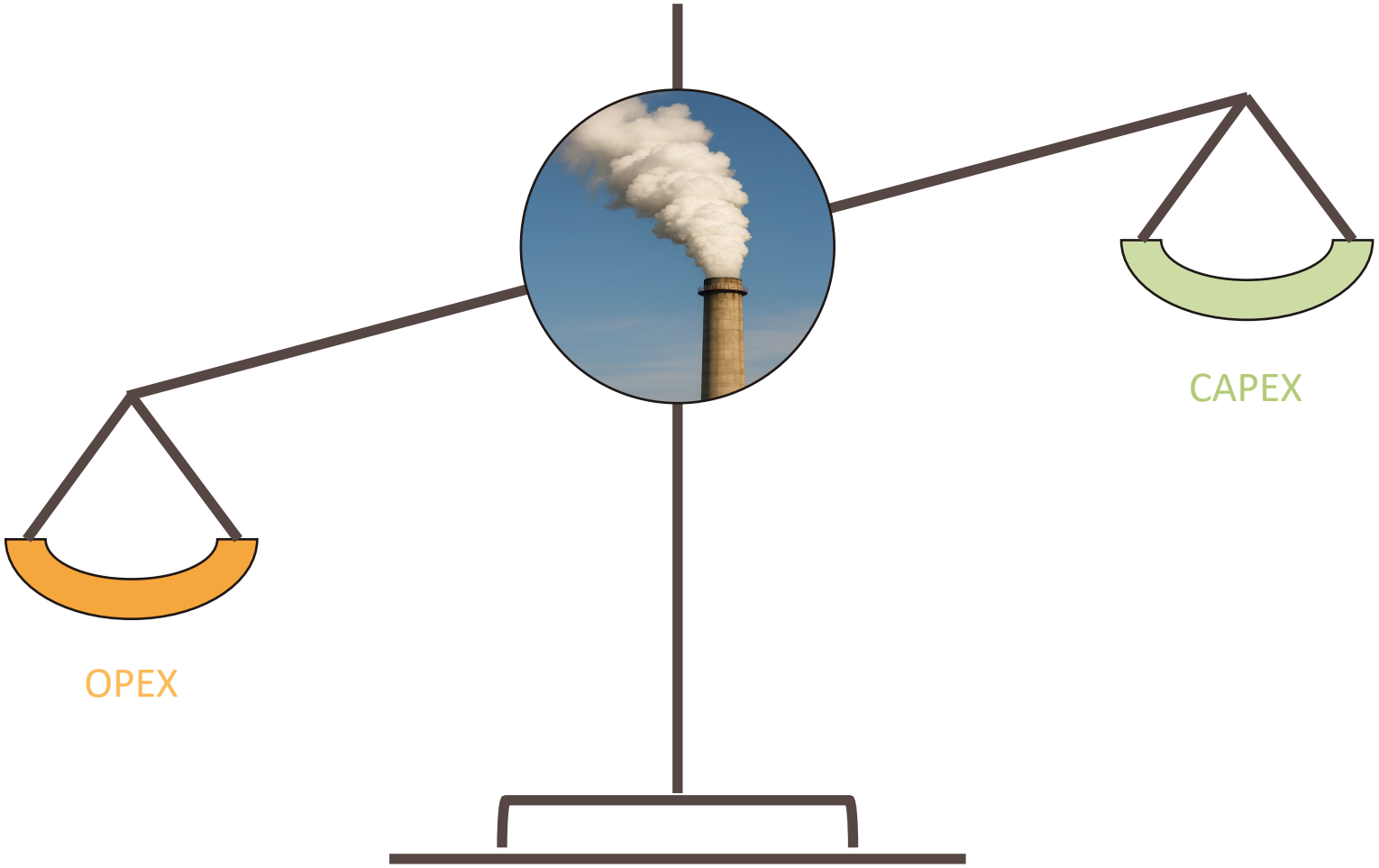
Carbon capture scale



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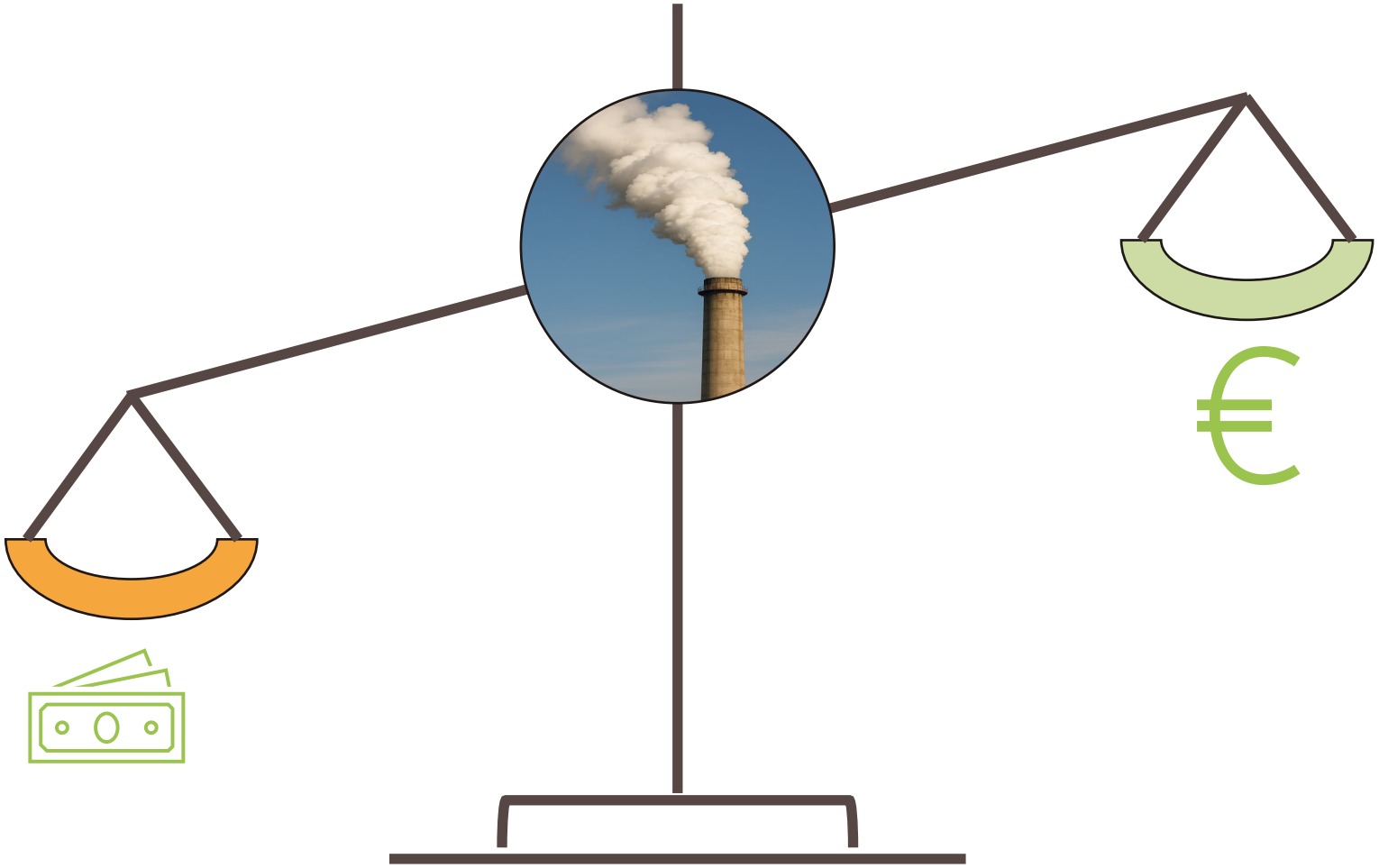
Carbon capture scale



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Hovyu’s pillars

Hovyu's carbon capture portfolio

Open solvents

- Known solvents (MEA, CESAR1)
- Thermally regenerated
- Possibility for heat pumps
- TRL8-9

Hyperion

- optimized solvents
- Electrified process
- TRL 6-7

ZEUS

- Non amine solvent
- Electrified process (electrochemistry regeneration)
- TRL 4-5

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Carbon neutrality

using

Hovyu’s Hyperion
Carbon Capture Technology

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▼ **50%**

SRD reduction

Novel process that reduces the energy requirements to around **2 MJ/kgCO_2**.

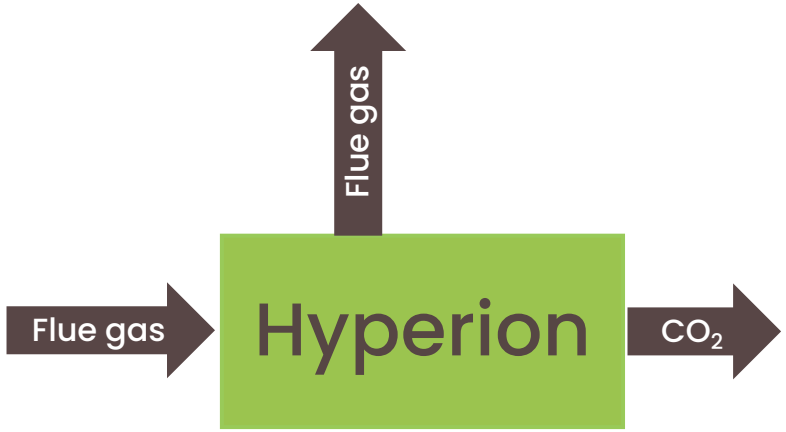
100%

Clean electricity

Eliminating the co-generation of CO_2 from extra CHP/boiler units

Hovyu's Hyperion Technology:

An electrified CO_2 capture process



Value Proposition

98+% CO_2 removal
Electrified process
Low energy requirement
Lower footprint
Lower CAPEX
No extra fossil fuel

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Hyperion development roadmap

Demonstrated in a lab environment (TNO pilot) in 2024

Prototype tested in Barcelona with real flue gas (Apr/24)

Mobile pilot* will be used to demonstrate the technology at industrial sites

*The mobile plant can run conventional solvents like MEA and CESAR1

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Hovyu's pilot (20 ft container)

- Design
  - Full height for CESAR1
  - Acid wash to avoid emissions
  - Fully automated (minimum operator requirement)
  - Ideal to test multiple solvents, absorption capacity, solvent stability, aerosol mitigation, etc.
- Flow rate: 40 Nm^3/h of flue gas
  - ~6 $kgCO_2/h$ (for a flue gas with 8% CO_2)
- Electricity requirement
- Easily transported and mounted onsite

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Portugal campaign

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Next steps

- 6 months campaign in an industrial site (Q3 2025)
- 6 months campaign at HVC waste incinerator (Netherlands, as part of ACERT Project) – Q1 2026
- 1st contract for a commercial Hyperion plant confirmed (Barcelona, Spain)
  - Project Start: Q3 2025
  - Plant delivery: Q1/2 2027

Carbon neutrality

using

Hovyu’s ZEUS
Carbon Capture Technology

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ZEUS

- Zero Emission-Ultra Stripping process
- Stripping at ambient temperature
- Patented non-amine-based process to capture CO_2
- Regeneration based on electrochemistry
- Potential CO_2 production up to 10 bar
  - cost savings on further CO_2 conditioning
- Tests planned to start August/25 at TNO
  - Integration with TNO miniplant
  - Material development from TU/e
  - Tests performed under the DRIVE Project

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Activities & Expertise

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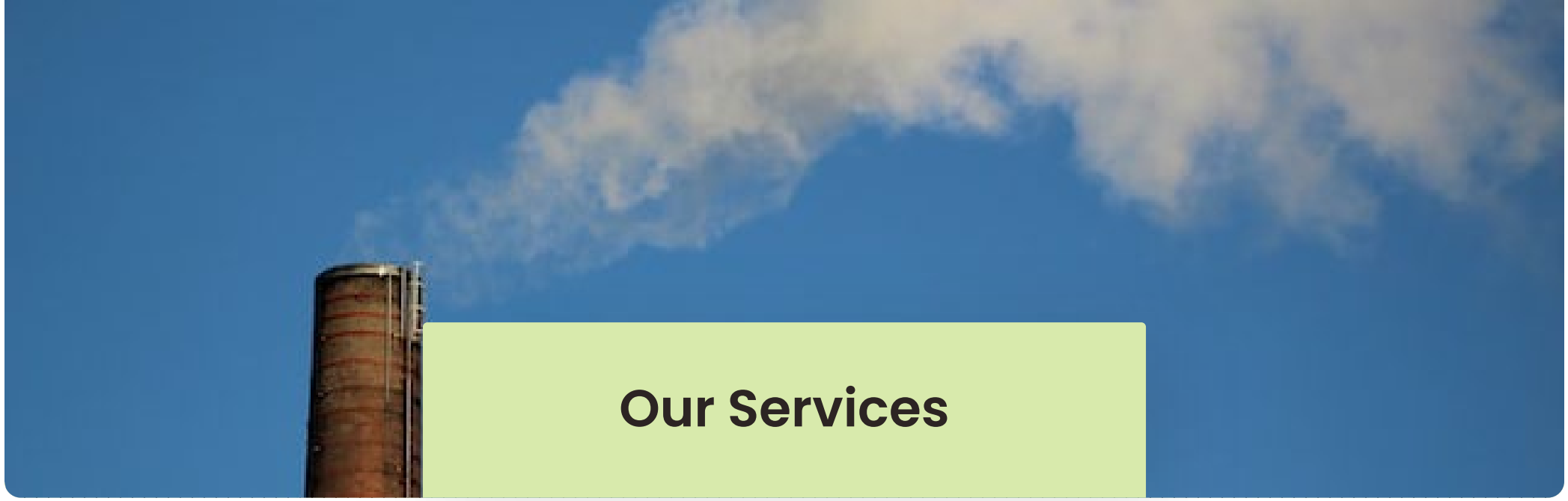

Our Services

ZERO-EMISSION INDUSTRY

- Construction and installation of CO_2 capture plants (from 1 kg/h (pilot) to 50 ktpa
- Biogas upgrading technology with lowest CH_4 loss (<0.04%)
- Direct air capture (DAC) through ZEUS technology

CONSULTING

- Feasibility studies and preliminary cost estimation
- Due diligence and support on process implementation
- Process troubleshooting and debottlenecking

R&D AND INNOVATION

- Development of own technology
- Stay up-to-date with latest developments
- Increase efficiency and reduce costs

TRAINING

- Tailormade CO_2 capture courses with the most updated developments
- Train operators to smoothly operate a CO_2 capture plant
- ProTreat® license and training

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Our expertise

Capture solvents

Smart engineering

Cost efficient process

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Ongoing RD&I activities

[Finished]

SCOPE

https://www.scope-act.org/

SCOPE project investigates the impact of emissions mitigation technology in an amine-based CO_2 capture process. Both technical and economical aspects of the process are evaluated in this project.

DRIVE

Deep Removal of CO2 &
InnoVative Electrification concepts

https://DRIVE-co2.eu/

DRIVE project will investigate the effects of deep carbon removal (>98%) in CO_2 capture processes. In this project both standard amine-base (with CESAR1) and electrified process will be tested and demonstrated. Among these, Hovyu's patented ZEUS technology will be tested.

Projects with no website:

- ACERT (TKI New gas)
- ECCSTAZE (RVO MOOI)

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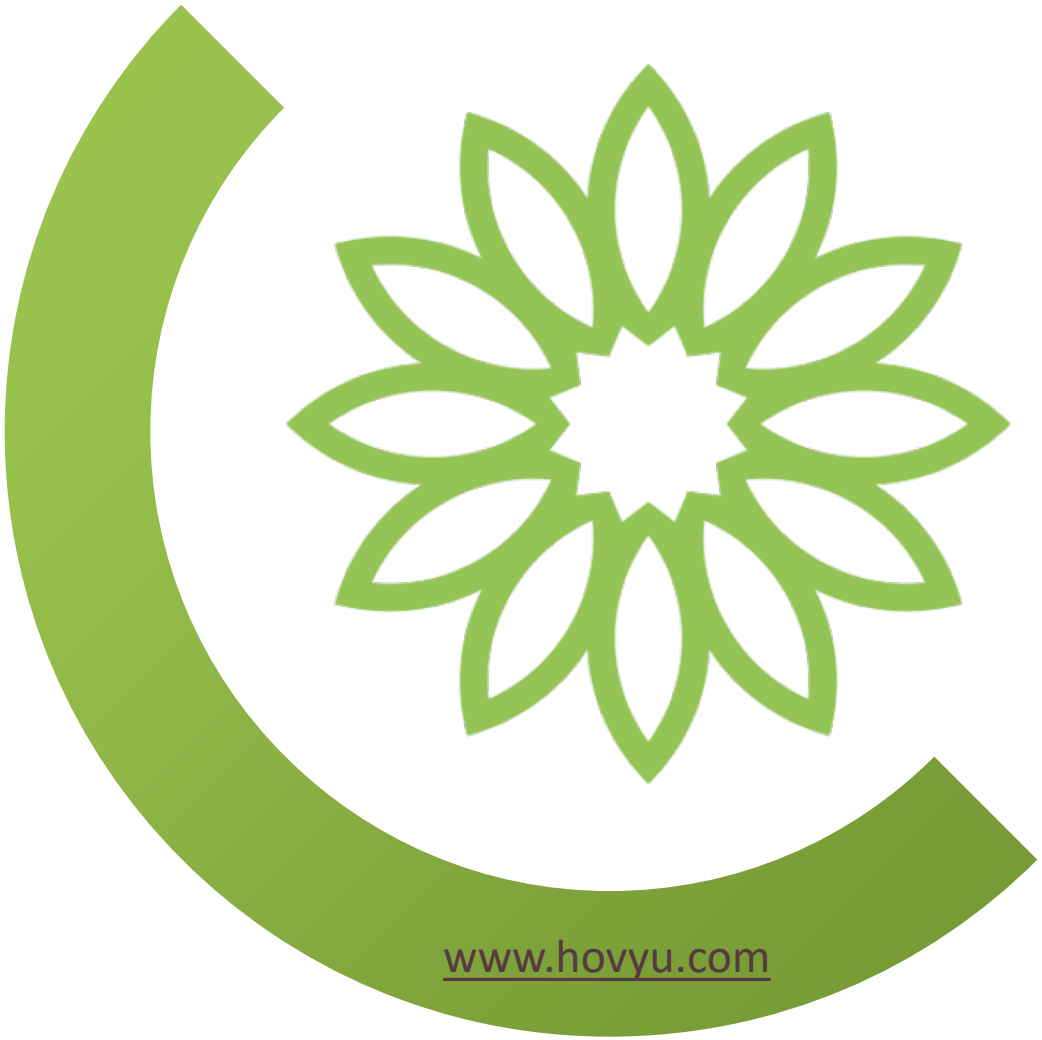
References

- Validation of Process Simulator with New Plant Data for MEA and CESAR1
- Thermodynamic Validation of CESAR1 Model and Effect of Water Wash Configurations
- Design of the world first PCCC unit installed and integrated on a floating offshore O&G
- Pilot plant campaign with two-phase solvent
- Pilot plant campaign with MEA
- SCOPE project
- Team with experience in more than 15 different carbon capture projects involving different plants capacity (from 1 kg/h to 100 ktpa) – References upon request

Thank You



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